INTRODUCTION

This Stormwater Management and Erosion Control Technical Notebook herein referred to as the Stormwater Notebook supplements the 1992 Department of Ecology (DOE) Stormwater Management Manual, defines how the DOE Manual is to be applied in the City of Redmond, and provides information and standards specific to stormwater management in Redmond. This Stormwater Notebook is intended to assist those who prepare and submit applications and construction documents by providing design requirements and processing information. The methods outlined in this notebook are not the only methods acceptable for use in the City, but any deviations from these methods must still meet or exceed the intended results and be reviewed and approved by the City. In cases where the information or requirements in the Stormwater Technical Notebook are different from the DOE Manual, this Stormwater Management and Erosion Control Technical Notebook will govern. A summary of modifications and additions to the DOE Manual is presented in Chapter 1 of this Notebook.

Code Requirements

Code requirements regarding stormwater management are outlined in the Redmond Community Development Guide Under 20E.90.10. References to the code in this Stormwater Notebook begin 20E. This notebook is a supplement to the Code and the Code should also be reviewed to understand the procedures and requirements.

Documents Adopted By Reference

The following documents are adopted by reference:

A. Redmond Community Development Guide Section 20E.90.10, Latest Edition.

B. The Department of Ecology *Stormwater Management Manual for the Puget Sound Basin*, dated February 1992, or its successor when approved by the Public Works Director.

C. Standard Specifications and Details for Public Works Construction, prepared by the City of Redmond Public Works Department, Latest Edition.

Accepted Standards

Drainage proposals must reasonably comply with accepted legal principles of drainage law in Washington State and be based on sound engineering principles.

How To Use The Notebook

Chapter 1 is the orientation you are reading.

Chapter 2 contains a detailed listing of the sections of the DOE Manual showing what applies in Redmond, what applies with modifications or clarifications, and what does not apply in Redmond.

Chapter 3 shows how to determine if a clearing, grading, and/or stormwater project needs a permit at all and if it is classified as "Small" or if it is classified as "Large".

Chapters 4 through 6 contain information related to Small Projects. Chapter 4 outlines the fees to be paid and the permit process. Chapter 5 deals with initial application requirements. Chapter 6 reviews the standards for construction plans for Small Projects.

Chapters 7 through 9 contain information related to Large Projects. Chapter 7 outlines the fees to be paid and the permit process. Chapter 8 deals with initial application requirements. Chapter 9 deals with standards for construction documents prepared for Large Projects.

Chapter 10 presents information about Rough Grading Permits. When appropriate, Rough Grading Permits are issued for clearing, grading, and certain types of stormwater work which is part of projects involving other work as well (Buildings, Plats, Short Plats, etc.) but where the clearing, grading, and related stormwater work can be started in advance of the other construction.

Chapters 11 through 15 provide information about what the Permit Review process is trying to achieve in terms of project performance and construction details. Chapter 11 presents general design goals as the target towards which we are aiming. Chapter 12 contains detailed design standards. Chapter 13 presents general temporary erosion and sediment control (TESC) strategies and Chapter 14 contains the detailed TESC standards. Chapter 15 contains standards related to drawings submitted to the City for review.

The Appendices contain the Stormwater Management Code (Appendix A-1), Forms (Appendix A-2), Standard Notes to be included on drawings (Appendix A-3), and Plan Review Checklists used to review the information submitted (Appendix A-4).

Additional City of Redmond requirements and special conditions listed on permits may apply to clearing, grading, or stormwater work in specific circumstances. While not necessarily a complete list, the following programs often apply to clearing, grading, and/or stormwater work in or near sensitive areas (defined in the Community Development Guide, Chapter 20D). Contact the Redmond Permit Center for more information about these programs:

- Shoreline Management Program – Can apply if your project is near Bear Creek, Evans Creek, the Sammamish River, Lake Sammamish, or their flood plains.

- Sensitive Area Management – Can apply if your project proposes work within steep slopes, wetlands, wetland buffers, streams, stream buffers, or flood plains (as defined in the Community Development Guide, Chapter 20C.40).

Other agencies may also have requirements and permits related to work in Redmond. While not necessarily a complete list, the following agencies and their permits have been a part of many projects in Redmond:

- State Department of Fish and Wildlife -- **Hydraulics Project Approval (HPA)** for work in surface waters or defined channels that carry surface water.

- State Department of Ecology -- **NPDES Permit(s)**; programs related to water quality management where sites clear over 5 acres.

- Corps of Engineers -- programs related to wetlands.

- Federal Emergency Management Agency -- programs related to flood protection near major streams and rivers.

- See also DOE Manual, page I-3-14.

Also note that any work proposed on adjacent properties requires written concurrence of the owners of those properties.

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PART I – ORIENTATION

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CHAPTER 1

MODIFICATIONS TO THE DEPARTMENT OF ECOLOGY MANUAL

Redmond Requirements

Clearing, grading, and stormwater management issues relating to construction are regulated by section 20.E.90.10 of the Redmond Community Development Guide. Issues not addressed in the Guide are regulated by the requirements of this Stormwater Notebook. The Department of Ecology Stormwater Management Manual for the Puget Sound Basin shall regulate issues not addressed in the Community Development Guide or this Stormwater Notebook.

Key Modifications for Redmond

- Infiltration may be used for recharge or as a method of discharging surface water only as a final option and only where careful analysis demonstrates it is suitable. Infiltration must be preceded by water quality treatment for all flow to be infiltrated from surfaces subject to contaminants if the site is in a well-head protection zone. If the site is not in a well-head protection zone, at least the standard water quality storm must be treated. Aquatards may be used only as top layers in open stormwater infiltration ponds (with good access for maintenance and replacement of the aquatard material).

Applicability of the February 1992 DOE Manual In Redmond

Volume I

Chapter I-1 — Used for reference only in Redmond.

Chapter I-2 — Use definitions and project classifications (e.g., "small" and "large") contained in Redmond documents.

Small Parcel requirements are used for small projects.

The following Minimum Requirements apply to large projects (as defined in this Notebook)

Minimum Requirement 1 (Erosion and Sediment Control)

All items apply, at least in general, with the following modifications:

1-6 Stormwater and TESC design criteria are as specified by Redmond in the City's code and in the specific project approval letters (and are subject to reasonable use doctrine).

1-7 Applies except Redmond's TESC design storm is the 10-year frequency storm.

1-12 Applies (unless dewatering produces clean water as could occur with perimeter well-points).

Minimum Requirement 2 (Preservation of Natural Drainage Systems)

Generally applies although discharge can be to an approved stormwater conveyance system.

Minimum Requirement 3 (Source Control of Pollution)

Applies.

Minimum Requirement 4 (Runoff Treatment Best Management Practices)

Applies although appropriate areas for infiltration systems are limited.

Minimum Requirement 5 (Streambank Erosion Control)

Applies.

Minimum Requirement 6 (Wetlands)

Applies except BMP approach is utilized rather than the standards if the standards cannot be met. In Redmond, wetlands created as part of a stormwater system cannot be regulated wetlands (and cannot therefore be counted as mitigation for disturbance of regulated wetlands).

Minimum Requirement 7 (Water Quality Sensitive Areas)

Applies.

Minimum Requirement 8 (Off-Site Analysis and Mitigation)

Applies but is subject to modifications in Conditions of Approval for specific projects.

Minimum Requirement 9 (Basin Planning)

Applies although Redmond is just starting to develop applicable Basin Plans.

Minimum Requirement 10 (Operations and Maintenance)

Applies.

	Minimum Requirement 11 (Financial Liability) Financial assurance generally applies in Redmond.
Chapter I-3	Small Parcel TESC (temporary erosion and sediment control) plan checklist, as modified for Redmond, is contained in Appendix A-4 of this Notebook. Large Parcel TESC plans are required. Stormwater Site Plan (SSP) outline generally applies.
Chapter I-4	Generally applies in Redmond.
Glossary and Notation	Generally applies in Redmond unless specific definitions are provided in Redmond documents.

Volume II

Chapter II-1	
Sections 1.1-1.3	Used for reference only.
Section 1.4	Basic principles constitute basis of erosion control design in Redmond.
Chapter II-2	Applies in Redmond with modifications as follows: • Slopes: Proposed slopes shall be 3:1 or flatter and may be up to 2:1 on roadway grades. • Steeper slopes shall be structurally supported. • Rockeries under four (4) feet are not regulated. An engineer shall design retaining walls and rockeries over four (4) feet. Rockeries over four feet shall only be used against cut slopes. Rockeries and retaining walls shall not exceed eight (8) feet in height.
Chapter II-3	Applies in Redmond.
Chapter II-4	NPDES Permits are administered by DOE. Redmond may require that the permits from DOE be obtained before issuance of a Redmond permit.
Section 4.3.1	Generally applies in Redmond.
Section 4.4.7	Use checklist in this notebook for materials submitted to Redmond.

Chapter II-5	Generally applies in Redmond. Specific modifications include:
Page II-5-6	Manure mulches not allowed in Redmond.
Page II-5-11	Slopes steeper than 3:1 are not permitted without variance to standards in Redmond, except 2:1 slopes are permitted for roadway sections in City rights-of-way.
Page II-5-17	Middle ("spoke drain") detail not used in Redmond. Bottom details modified to show start of cut at drip line.
Page II-5-19	Setbacks are set in the Redmond Sensitive Areas Ordinance (SAO).
Page II-5-31	Construction entrance; reference Redmond Standard Detail #503.
Page II-5-35	Pipe Slope Drain. Note that this is "temporary only".
Page II-5-78	Filter Fence. See Redmond Standard Details.
Page II-5-79	Straw Bale. Not used in Redmond.
Page II-5-83	Brush Barrier. Not used in Redmond.

Volume III

Chapter III-1	Used in Redmond, modified as follows:
Page III-1-1	Design storms are specified in Redmond Community Development Guide.
Page III-1-2	Correction factor not required. Redmond Code specifies that the predeveloped ground cover is considered to be either forest, meadow, or wetland. No impervious surface is assumed in the predeveloped condition. Typically, the Forested conditions occur in the uplands and the meadow condition occurs in the valley floor. This predeveloped condition restriction minimizes the assumed predeveloped discharge from the site. Further, the predeveloped time of concentration is maximized to maintain a low discharge rate from the predeveloped site. In Redmond, this approach to detention sizing is essential to have existing highly developed areas “correct” back to un-developed allowable runoff levels. This approach, therefore, has been selected over that in the Ecology Manual where a factor of safety is applied to sizing but the sizing of detention systems is based on current existing (developed) conditions.
Page III-1-4	Predeveloped time of concentration calculations shall include not less than 300 feet of sheet flow (regardless of actual site situation).
Page III-1-12	Redmond predeveloped land use is meadow for low lands, forest for hill tops, or wetlands.

Chapter III-2	Used in Redmond, modified as follows:
Page III-2-2	In some limited cases the "Rational Method" may be used to develop peak flows for conveyance systems. The Stormwater Engineer must approve the applicant's method and procedure.
Page III-2-3	Pipe specification shall be as indicated in the most current Standards And Details for the City of Redmond. Structures, in addition to the specified design standards, shall be placed in conjunction with all frontage improvements that collect roadway runoff in a defined curb and gutter section.
Page III-2-5	Minimum clearances are: • 12 inches vertical. • 5 feet horizontal. • 8 feet horizontal from trees. • 18 inches minimum cover over pipes in vehicle areas. Pipe sizing analysis shall be for the 10-year, fully developed, peak flow. If the pipe section is a conveyance culvert under roadway, the analysis shall be for the 25-year, fully developed, peak flow. If a stormwater facility is designed to control the 100-year developed flow, then the conveyance routes shall be analyzed for the 100-year, developed peak flow.
Page III-2-7	Other hydraulic computer programs may be used to compute the hydraulic grade line of a system with prior approval by the Stormwater Engineer.
Page III-2-8	Nomograph's minimum velocity is recommended but not required.
Chapter III-3	Used in Redmond, modified as follows:
Page III-3-3	Infiltration may be used as a last option for recharge and/or as a method of discharging surface water. However, infiltration must be preceded by water quality treatment for all flow to be infiltrated from surfaces subject to contaminants if the site is in a well-head protection zone.
Page III-3-4	For item GL-3, at least 200 feet shall be provided for separation from public wells.
Page III-3-6	The soil infiltration rate may be determined by a falling head test conducted by a qualified engineer using commonly accepted methods. Infiltration locations will be considered unacceptable if the design infiltration rate is less than 1.0 inches/hour. In no case shall the design infiltration be more than 3.0 inches/minute.
Page III-3-16	Paragraph 6 does not apply in Redmond. (Paragraph 6: "If the analysis indicates any of the conditions in General Limitation #2 are violated, then infiltration should not be pursued.")

Page III-3-20	Construction plans shall include a note to require field verification during construction of the facility, of soil conditions and infiltration rates by a qualified engineer, licensed in the State of Washington. The engineer shall provide a written statement to the City of Redmond related to the field verification of the design parameters.
Page III-3-69	Porous pavement is not permitted on surfaces regularly used by motor vehicles.
Page III-3-71	Concrete grids and modular pavements are not permitted on surfaces regularly used by motor vehicles.
Chapter III-4	Used in Redmond, modified as follows:
Page III-4-19	Gravity drains are not required for wet ponds or vaults. Access roads to pond bottom not required for wet ponds.
Page III-4-54	A minimum, average depth of 3 feet is required for wet vaults.
	Wet ponds and vaults, which are intended solely for water quality treatment, shall have a high flow bypass to divert peak flows above the water quality design storm.
Chapter III-5	Used in Redmond.
Chapter III-6	Used in Redmond, modified as follows:
Page III-6-1	Filter strips are not acceptable as a primary water quality treatment method to meet the code requirements.
Page III-6-4	Biofilters shall be located "off-line" whenever practical so flows greater than the water quality storm do not flow through the biofilter. If biofilters are not able to be located off-line, the swale shall be designed so the maximum flow possible in the swale (not over 100-year) does not produce a velocity over 4 feet per second.
Page III-6-7	Swales must be at least 200 feet long. Swale length may be reduced to 150 feet for redevelopment projects if no feasible alternative exists. Maximum swale bottom width shall be 8 feet (parallel swales can be acceptable, however.)
Chapter III-7	Used in Redmond, modified as follows:
Page III-7-3	Coalescing plate systems are a last choice for water quality systems in Redmond and require a formal, written maintenance plan approved by the Stormwater Division.

Page III-7-4	API separators rise rate shall be 0.2187 feet/minute.
Chapter III-8	Used in Redmond.
Volume IV	Used in Redmond.

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CHAPTER 2

LOCAL DESIGN PRACTICES

This chapter contains information on specfic issues which have arisen for projects in Redmond to help define what is necessary to meet our local codes and regulations and to help define terms in ways that are meaningful to specific engineering design situations in Redmond.

PROPER DRAINAGE

This Stormwater Notebook document describes minimum drainage requirements. These requirements must be addressed in all projects whether or not plans and permits are required. Even though plans and permits are not required for many small projects, proper drainage facilties are required with all projects.

Proper drainage directs runoff away from structures, meets legally accepted practice and meets the intent of Chapter 20E.90. For projects not requiring plans or permits, drainage systems are not required by code to have detention or formally designed water quality facilities. Nevertheless, if downstream conveyance capacity is not adequate, the project proponent may elect to provide detention or infiltration. Projects adding surfaces to be used by vehicles need to protect groundwater (using impermeable layers or paving) and must route runoff through a floatables separator before discharge from the site. Drainage systems shall be provided to prevent excessive standing water on developed areas, connect downspouts and provide positive drainage for footing drains.

IMPERVIOUS AREA FOR SINGLE FAMILY RESIDENTIAL PLATS AND SHORT PLATS

Projects creating lots for single family houses (residential plat and short plat projects) shall provide drainage systems for all lots. The drainage systems shall address runoff quantity and quality, based on the impervious area assuming no impervious area exists in the predeveloped condition.

These projects shall assume each lot has impervious surface based on the following formula. For each lot created, the assumed impervious area is taken as the area of the lot, less any unbuildable area times the percentage of allowable coverage (from the Land Use section of the Community Development Guide) times 0.80. However, the maximum impervious area one is required to assume for a lot is 4,000 square feet.

The total impervious area for these projects is taken to equal the paving, sidewalks, etc., required of the project plus the assumed impervious area of each lot.

SEPARATION OF SYSTEMS SERVING SEPARATE OWNERS

Stormwater facilities provided to control quantity and quality generally shall be provided within the site they are serving although certain exceptions are acceptable.

Facilities for single family plats may be located in common areas (even in public roads that are created by the plat or short plat).

Water quantity controls provided for the private part of a project may be designed to include water quantity control for the public impervious surfaces that are part of the project. Water quality facilities must not, however, be combined.

In some circumstances, water quantity and quality control requirements for the proposed impermeable areas may be met by adding such control(s) to equivalent existing developed areas of the site, which do not already have such controls.

PUBLIC WATER QUALITY FACILITIES

Water quality controls for impermeable areas to be public shall be biofiltration facilities unless there is no alternative. Lack of land in the project area shall generally not be considered reason for an alternative treatment system.

Where biofiltration is not possible, a gravity-type water quality treatment facility shall be provided. (For projects below the thresholds requiring plans and permits, a flotables separator shall be provided for surfaces used by vehicles.)

CONTRIBUTION IN LIEU OF PROVIDING COMPENSATING FLOOD STORAGE

Compensating flood storage is required in certain areas of the city for projects proposing filling in a floodplain.

In general, the compensating storage shall be provided onsite or an approved offsite location during project construction. Under very unusual, limited situations, the City may accept contribution to an existing public project that would then provide the extra required storage. The following conditions shall be met before the City should consider project contribution.

1. The public project being contributed to shall be feasible.

   Project shall be physically able to be constructed. The project shall be legally able to be constructed including land ownership or use authorization, and all permits that could effect feasibility are completed.

2. The project shall be on the currently budgeted CIP list and shall have required public funding.

3. The project shall be scheduled for construction within five years of the start of construction onsite.

4. The project shall have adequate staffing to be completed.

5. Allowing the contribution in lieu of construction shall not create an unsafe situation.

6. The monetary contribution shall be equal to the pro-rata volume share of the actual project including all costs (such as land acquisition, consulting, staff time, permits, construction, monitoring/as-built adjustments, and so forth).

INTERNAL BUILDING CHANGES AS RE-DEVELOPMENT

Redevelopment projects that are confined to existing interior spaces shall not require new drainage controls (except those drainage systems described above as may be required by the City for proper drainage).

If redevelopment projects include any work involving the exterior part of the site, the project shall be subject to redevelopment requirements under Chapter 20E.90.10. Where exterior work occurs, the value of the interior work shall be included in determining the extent of exterior redevelopment requirements.

SITE IMPROVEMENTS INVOLVING HAZARDOUS MATERIALS

Site improvements to existing facilities that would otherwise not be subject to stormwater system improvement but involve hazardous materials shall meet the water quality requirements of Section 20.E.90.10.

MIXING CLEAN WATER WITH SITE RUNOFF DURING CONSTRUCTION

The following is a design goal: Stormwater that has been treated for water quality shall not be mixed with stormwater that has not been treated for quality.

"PRE-DEVELOPED" CONDITION

Hydrologic computations to size water quality and quantity control for sites above the Sammamish Valley Floor shall assume a pre-developed condition as 100% second growth forested. All sites will assume a pre-developed site condition as 100% pervious.

BMP SELECTION CRITERIA

Public detention systems shall be an open pond. Other detention systems will be considered only after the Stormwater Engineer is convinced that an open pond is not feasible.

DISCHARGE TRIBUTARY TO LAKE SAMMAMISH

The Sensitive Lake Protection Menu, Section 1.2.8.1 of the 1998 King County Surface water Design Manual shall be implemented for all areas, 5,000 square feet or greater, subject to development, which contribute flow to Lake Sammamish and meet the definitions of pollution generating impervious surface (PGIS) or pollution generating pervious surface (PGPS), as defined in Section 1.2.8 of the 1998 King County Surface Water Design Manual.

CHAPTER 3

PROJECT CLASSIFICATION IN REDMOND

This chapter provides information to classify and pursue projects that involve only clearing, grading, and/or stormwater management work. Start with Chart 3-1 and follow the path through the other charts as directed.

Projects involving work other than, or in addition to, clearing, grading, and/or stormwater management work (buildings, plats, short-plats, etc.) would typically involve other Redmond permits and processes. For such "larger-scope" projects, check with the City of Redmond Permit Center. For the "larger-scope" projects, the standards that follow will still apply to the clearing, grading, and/or stormwater management parts of the project.

CHART 3-1

The charts in this document apply only to clearing, grading, and stormwater management work. These charts help you determine whether the project needs formal plans and whether the project is classified as small or large. Start with this chart.

Does The Project Involve <u>Any of</u> The Following?

- Building Permit
- Subdivision Process
- Site Plan Review
- Work Other Than Clearing, Grading, and Stormwater Management

Yes, One Or More Of The Items Above are Involved in The Proposed Project:

- Contact the Redmond Permit Center for information about the proposed project – the project involves more than just clearing, grading, and stormwater management.
- Use this Notebook for information about the clearing, grading, and stormwater management aspects of the project (what to include in applications, standards, etc.)

No, The proposed Project Does Not Involve Any of The Items Above:

- Go To Chart 3-2

CHART 3-2

If the project is clearing, grading, and stormwater work only, this chart shows if a City Permit and City-approved plans are required or not required.

Does The Proposed Clearing, Grading, and/or Stormwater Management Project Meet <u>All</u> Of The Following Criteria:[1]

- Clearing is less than 5,000 square feet.
- Earthwork is less than 50 cubic yards.
- Work is not in Sensitive Area or its Buffer.[2]
- Work is not in a public right-of-way or other City-owned land.
- Work will not become owned or operated by the City of Redmond.
- Project will create less than 5,000 square feet of impermeable surface.
- Work does not involve construction of storm drain pipes over 10-inches in diameter.
- Work will not modify or affect a private or public runoff quantity or quality control facility.

If Yes, The Proposed Project Meets <u>All</u> The Criteria Above, Then:

- The proposed clearing, grading, and/or stormwater management project does not need City-approved plans or a City permit.

- The project must still provide adequate drainage as described in Chapter 2, Chapter 11, and Chapter 13

- The project is not <u>required</u> by code to provide formal runoff quantity control (detention) or quality controls unless it has elements that generate pollutants. Contact the City's Stormwater Engineer for further information about runoff quality control if the project has paving for vehicles or other potential pollution sources (such as fuel pumps, vehicle wash areas, etc.)

- While not required by code to provide runoff quantity control, the proponent should consider such a facility if downstream flooding or erosion is occurring or is expected. Contact the Stormwater Development Review Engineer for further information if it is needed.

If No, The Proposed Project Does Not Meet <u>All</u> Of The Criteria Above Then:

- Go To Chart 3-3

[1] Additional official definitions are contained in the Community Development Guide

[2] Sensitive Areas are defined in the Community Development Guide

CHART 3-3

This chart separates the proposed clearing, grading, and stormwater projects into either the "Small" or the "Large" category.

Does The Clearing, Grading, and/or Stormwater Management Project Meet <u>All</u> The Following Criteria:[1]

- Clearing is less than 30,000 square feet.
- Earthwork is less than 500 cubic yards.
- Project will create less than 5,000 square feet of impervious surface.

Yes, The Proposed Project Meets <u>All</u> Of The Criteria Above:

- The proposed clearing, grading, and/or stormwater management project is classified as a "Small" project.
- See Chapter 4 for Fees and Permit Process.
- See Chapter 5 for Application Requirements.
- See Chapter 6 for general information about Construction Plans.
- See Chapter 11 through Chapter 14 to review General And Detailed Standards that <u>could</u> apply to the project.

No, The Proposed Project Does Not Meet <u>One Or More</u> Of The Criteria Above:

- The Proposed clearing, grading, and/or stormwater management project is classified as a "Large" project.
- See Chapter 7 for Fees and Permit Process.
- See Chapter 8 for Application Requirements.
- See Chapter 9 for general information about Construction Plans.
- See Chapter 11 through Chapter 14 for General And Detailed Standards.

[1] Additional official definitions are contained in the Community Development Guide, Section 20A.20.